

Recover an unbootable PC

How do you retrieve your data if your computer won't boot?
Jon Thompson explains how to recover a crashed system

Your PC won't boot. It might have been a system tweak too far or a genuine hardware failure. So what can you do to access your data? Plenty, as it turns out. We'll show what can go wrong with the boot sequence before demonstrating how to put things right in Windows XP, Vista and Linux.

When you power up your computer, the processor executes a program stored in the BIOS called the Power On Self Test (POST). This performs a full test of the system's RAM, after which it probes the motherboard and the peripherals attached to it, tests and initialises them. If POST isn't happy with what it finds, it halts proceedings. Sometimes you'll see an explanatory message on the screen, but you'll always hear a series of coded beeps from the system speaker. The codes tell you where the problem lies. A single beep means that everything is OK. Other sequences depend on your BIOS.

But if you're in front of an unbootable PC with no access to the internet, how do you look up these settings? The answer is to go to www.bioscentral.com now and print off the POST beep codes for your BIOS. Place them somewhere safe; if you have a hardware failure that prevents you booting the computer, you'll have this information to hand. It could be that thermal expansion and contraction over successive months or even years has made a connector or a card come loose. Rather than being a genuine hardware failure, it may be that the card or connector simply needs re-seating. The beeps will tell you which part of the computer to start investigating, but only if you know what they mean.

If the hardware checks out fine, POST displays the BIOS's logo, some information about the memory and peripherals and then gives a short timeout during which you can press a key to enter the BIOS configuration.

POST's final task is to load the operating system on the active partition. It does this by loading the content of the master boot record (MBR) on the boot device. Once loaded it runs this code, called the boot loader. There are only a few hundred bytes available in the MBR, so the boot loader is in two parts. The first usually

loads the content of the much larger boot sector, which is found on the active partition that in turn does the heavy lifting involved in starting the operating system. The MBR and boot sector are critical parts of the boot process, but they do go wrong. Luckily Windows XP, Vista and Linux all have ways of making them work again.

RECOVERY IN WINDOWS XP

When your Windows XP PC passes the POST, the boot loader should begin loading Windows. To do so, it loads and hands control to the kernel, which in turn loads the drivers, mounts the disks, starts the services, anti-virus system and firewall, and finally presents you with a working Windows XP desktop. Unfortunately, some virus writers think it's clever to overwrite the MBR with gibberish so that you receive coded beeps and a blank screen after POST when you try to boot your computer. If this occurs, you'll need to restore the MBR and possibly the boot sector to rescue your data, prior to beefing up your malware protection.

First, boot from a Windows XP installation CD. If you don't have one, borrow one from a friend for the purposes of using the system recovery tools, but don't take a copy because that would be an act of software piracy.

Once the Windows setup program loads, press the R key to run the Windows Recovery Console. This is a reduced version of the Windows command-line environment, and it contains a number of useful utilities. We first need one called fixmbr. Enter its name on the command line and press Enter, and you'll receive

```
Windows XP Professional Setup

Welcome to Setup.

This portion of the Setup program prepares Microsoft(R)
Windows(R) XP to run on your computer.

• To set up Windows XP now, press ENTER.
• To repair a Windows XP installation using
  Recovery Console, press R.
• To quit Setup without installing Windows XP, press
```

▲ The Windows XP Professional Setup Welcome page

INTRODUCTION

Your computer won't boot, but it's holding the only copy of your important files. Do you spend time and money getting a data recovery expert in, or format and start again? Before you reach for the credit card or accept defeat, read our comprehensive guide to recovering a crashed system.

If you find that you need a bootable XP disc to run recovery utilities, read our guide in *Computer Workshop* on page 182.

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Better safe than sorry Back up in seconds

Backups are often thought of as an unavoidable, lengthy chore until there's a disaster, at which time they become pure gold. You don't need to back everything up, however.

If you're the only user, there's no point backing up the whole Windows My Documents tree or Linux's /home directory. Try placing the files you change regularly (and want backed up often) in their own directory structure. Compress them in one go using a Zip utility and copy them to an optical drive. You could automate this and have it happen just before the system shuts down each day.

Another tip is to use an old machine or a dedicated NAS device as a file server. If your working machine crashes, the files are still available. It also helps if your file server runs a different operating system from your desktop PC, just in case you get a virus capable of travelling to other machines and destroying them. An old Windows 98 machine, cleared of games and other detritus, makes an ideal server, as does a Linux server running the Samba Windows server package. Back this machine up regularly, perhaps every Saturday morning before embarking on a shopping trip.

a dire warning about the possible implications of continuing. As the MBR is already corrupt, you can safely ignore this. Press Y and hit Enter, and the command will overwrite the MBR with a new copy of the boot loader.

Reboot the machine and hold down the F8 key after the POST screen appears. This will provide access to the Windows boot options. This prevents you running Windows directly for the moment and also serves to test that the restored MBR can read the boot sector.

If it can't, you'll see a "Can't Load Operating System" message. This means the boot sector is also corrupt. All is not necessarily lost, because we can also fix this from the System Recovery Console. Boot again from the XP installation disk and reload the console as before. This time, issue the fixboot command along with the Windows name of the drive that contains the broken boot sector. For example:

```
fixboot c:
```

Enter Y after the warning text and press Enter. Reboot the system and see if it'll respond to F8 properly. If you get a message saying "NTLDR is missing", it's possible someone or something has renamed or deleted the ntlldr and ntldetect.com files from the C:\ directory. Go back into the Windows Recovery Console and copy these from the installation disc using these commands:

```
copy d:\i386\ntldr c:\
copy d:\i386\ntdetect.com c:\
```

We've used d: to denote the drive containing the installation CD. On your system it may be another letter, depending on the hardware in your system.

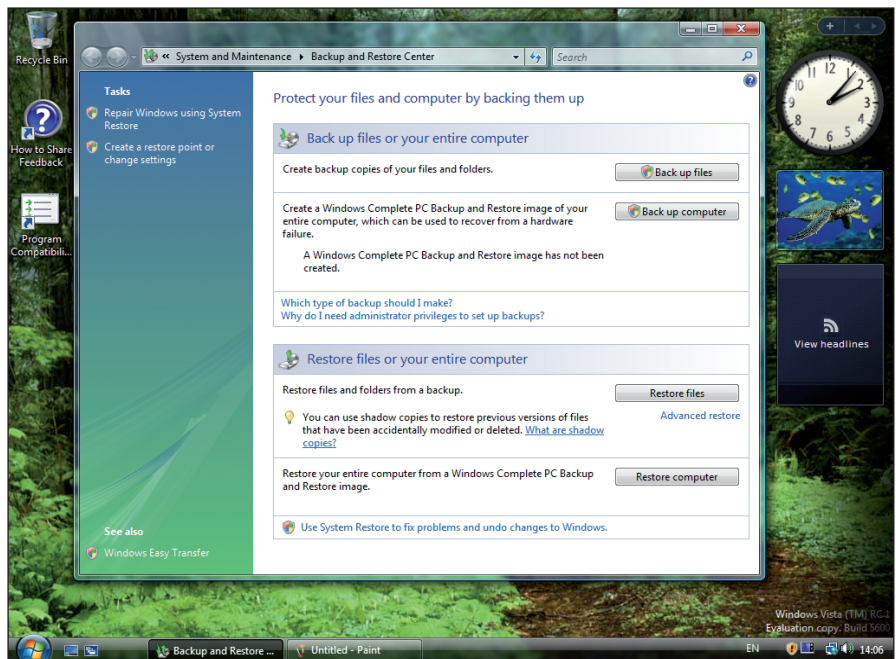
Reboot the system and, if Windows exists on the hard disk, you should be able to bring up some boot options by pressing F8 after the POST screen. These boot options include Safe Mode and Last Known Good Configuration. Select Safe Mode and press Enter. This will boot the machine with the minimum of services and drivers loaded, which is ideal if your boot problems started after you loaded a new driver or software patch. Once booted, you can reset the changes you made, run a full virus scan or uninstall the software that you suspect caused the problem.

The F8 option that offers to revert to the last known good configuration is ideal if you made a disastrous Registry change that won't allow you back into Windows, or if your PC has had an infection that you believe has scrambled the Registry. Using this option restores the last known good set of Registry keys and settings, but be sure you want to do this, because the reversion is permanent.

As a precautionary measure, to avoid having to find your Windows XP installation CD, you can also install the Windows Recovery Console as a boot option for later use. This sits in a 78MB partition, which its installation creates automatically. To install the console, boot into Windows XP normally and insert the installation CD. Click on the Start button, select Run... and enter the following command:

```
D:\i386\winnt32.exe /cmdcons
```

Substitute the letter of your CD drive in place of D:. Confirm you want to install the partition.



▲ By creating a restore point before a major system change, you can turn back time if needs be

If you reboot you will see that, rather than simply booting into Windows XP, you'll be given a second option to boot into Windows Recovery Console.

After a timeout (or hitting the Enter key), Windows will boot normally. If instead you move the cursor to the Recovery Console and press Enter, the command line-based console loads, and you'll be asked to select which installation of Windows you want to log on to. There's usually only one, after which you'll be asked for the administrator password, which is usually blank, unless you were sensible and set one when you first installed Windows.

The chkdisk command is a useful command that you can run from the Recovery Console. It checks the disk for errors and has two command-line switches. The /p option performs an exhaustive set of tests on the disk and tries to correct any errors. However, /r locates bad sectors and attempts to retrieve the information they contain. This is useful when you suspect your drive is accumulating bad sectors.

This problem is sometimes highlighted by error messages that claim you cannot save a file due to low disk space, when you know you have plenty. This command is also available from within a running Windows XP session, but it's wise to avoid running the operating system if you suspect a worsening disk problem. More information about the use of the console is available at <http://support.microsoft.com/kb/314058>.

Don't try to use the Windows XP Recovery Console to recover a crashed Windows Vista installation; it can't handle Vista passwords. Luckily, system recovery in Microsoft's new flagship operating system is simplicity itself.

RECOVERY IN WINDOWS VISTA

The Windows Vista installation disc contains a comprehensive and automated recovery suite called the Windows Recovery Environment. Whereas Windows XP users have to fix the MBR and the boot sector manually, and scan the disk for errors, Vista automatically checks and corrects all these things, and more. If there's

a problem, the tools within the Recovery Environment fix it automatically. If a problem remains, you can roll back the system's state to a time before the problem became apparent.

To access the Recovery Environment, boot from the Vista installation DVD. Select the language and country and press the Next button. The subsequent screen gives the option to install the operating system. Down at the bottom left, you'll also see two options labelled 'What to know before installing Windows' and 'Repair your computer'. Click on the latter.

You'll receive a pop-up that presents a set of recovery options. If Vista won't start up, select the 'Startup repair' option. This will check the MBR, boot sector and startup files, making any changes it needs to get you into a bootable position. Unlike Windows XP, in which we have to boot into the recovery console and manually fix the MBR and boot sector ourselves, the startup repair option will do all this, and plenty more, before rebooting the machine and hopefully allowing you to log in.

If you have a USB drive inserted, the startup repair process sometimes examines this instead of the active partition. Because it can't locate an MBR, it gives an error. To avoid this, remove all USB and other external drives before running the startup recovery tool.

The second option is useful when you want to back-track to a previous restore point. This option assumes that you have created a pre-emptive restore point before making any serious changes to the operating system or installing dodgy software. Making a restore point before a major change is a good idea, but it is not a substitute for performing regular backups. Here's how you do it. As when creating a Recovery Console partition in Windows XP, you create restore points from within a running Vista session. Click on the Start button, select All Programs then Maintenance and finally Backup and Restore Center.

One of the options on the left-hand pane of the resulting window is 'Create a restore point or change settings'. Click on this and confirm that you want to continue. Select the disk for which

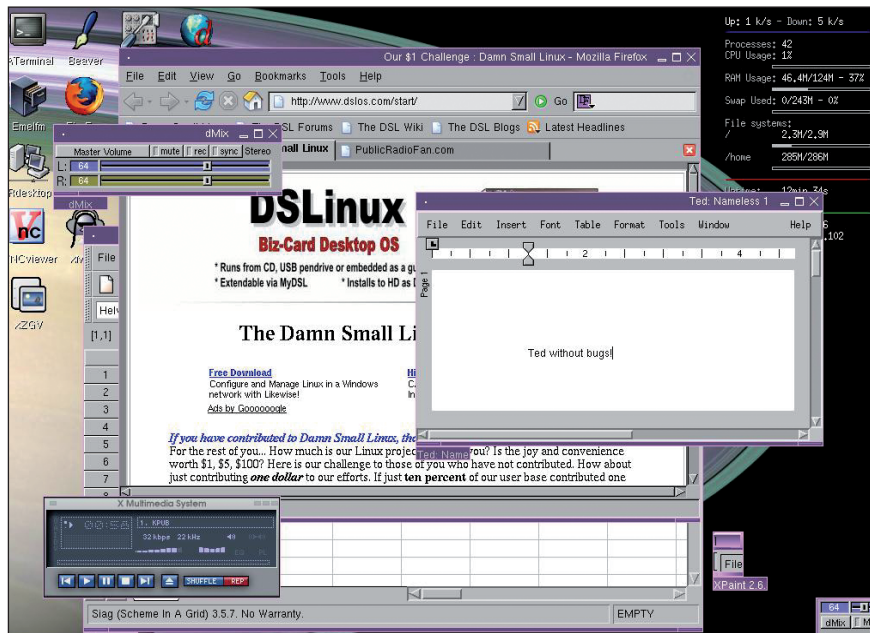
Small wonder Installing Linux on a USB device

If you don't have a Live CD to hand, you can restore a Linux PC by booting into a floppy-based Linux distribution. Unfortunately many modern PCs, especially notebooks, don't have a floppy disk drive. However, you can install Linux on a USB device, even an old MP3 player. A modern BIOS allows you to specify USB as a boot device. It just needs an MBR.

Damn Small Linux (DSL) is a distribution that boots initially from Live CD and, once running, can install itself on a USB device. It supports the Reiser journalling file system, as well as ext2 and ext3, and can mount FAT partitions and MS-DOS floppies, too.

Follow the instructions on the DSL website (www.damnsmalllinux.org) to download the image and burn it to disc. Boot it and right-click anywhere on the desktop's background to access the start menu. Select Apps, Tools, Option and For USB-HDD Pen drive.

A dialog box pops up. Press Enter to see your USB drive details and note the device name (usually beginning with sda). Type its name when asked and then press Enter. Because you'll be wiping the device and installing DSL Linux, you need to enter l at the next prompt. Then enter l, because you'll be installing from the Live CD. Press Enter on the boot options and language/keyboard options. Finally, confirm that you want to wipe your USB pen drive. You must enter Y



▲ Whether you're on the move or recovering crashed systems, Damn Small Linux could be ideal

both times when asked. The installation begins. This may take a few minutes, depending on the speed of your USB device.

To test the USB pen drive installation, you must reboot the machine and make sure that

USB is the first boot device in the BIOS. The BIOS will try to boot DSL Linux. You need to press Enter when asked for boot options, and then the machine will boot from the USB drive.

you want to create the restore point and then press the Create... button. Enter a name for the restore point in the subsequent prompt and press the associated Create button. After a few seconds, you should receive a confirmation that the restore point has been completed.

If you can boot into Vista and want to roll back your system state to a restore point, you can do so by running the Backup and Restore Center and selecting the 'Repair Windows using System Restore' option. Confirm your action and a wizard pops up. Press Next and select a restore point. Press Next again and Finish, and Vista restores and reboots the system. Restoring a restore point from the Vista Recovery Environment on the installation DVD is the same. Simply select the restore point and wait for a reboot.

In Vista, the NTFS specification has changed. If you wish to install Linux after Vista (in a dual-boot configuration), repartition the disk using Vista rather than Linux. Install Linux into the new

partition and all should be well. The reason for doing it this way is that Linux doesn't understand the new NTFS format as used by Vista and will trample all over the Vista installation. Partition tools written for Windows XP will also make a mess of the Vista partition.

RECOVERY IN LINUX

While Linux is generally a stable and resilient operating system, things can still go wrong. Such situations arise from inexperience or badly edited configuration files rather than malicious code such as viruses. Modern journalling file systems ensure that, even after a power outage, disk corruption is rare. Because of this, the most common cause of an unbootable Linux system isn't hardware failure but a system tweak too far. This could include installing Windows in the hope of creating a dual-boot system.

If you try this and lose Linux as a boot option, your first port of call should be one of the free Live CD versions of Linux given away each month on countless magazine covers or available for download from sites including www.knoppix.com. Simply boot using one of the free discs, or burn your own. If the disk on which your file systems reside is intact, you can perform a raw mount:

```
# fdisk -l
# md /<directory>
# mount -t ext3 <filesystem>
# cd <directory>
```

The fdisk -l command will allow you to see the raw file systems

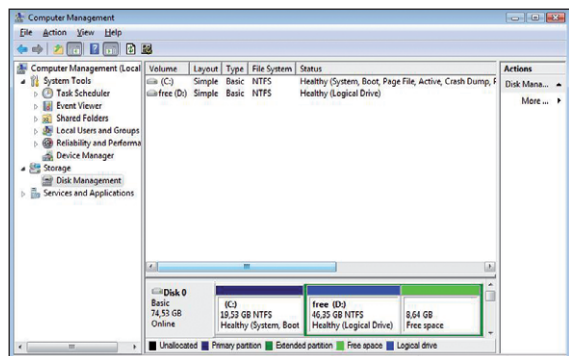
(/dev/hda0 and suchlike) and their common names. You then make a directory to serve as a mount point and mount the raw file system on to that mount point.

Modern Linux systems use ext3 or Reiser journalling file systems. Assuming the file system you're mounting is Reiser (openSUSE uses this, for example), use 'reiserfs' in place of 'ext3' if you get an error when running the above commands. It is a good idea to familiarise yourself with the file system types used by the system. Examine the details in the fstab file to find out what is being used, in case you ever have to mount the raw file system in this way.

Once you have mounted the drive, you have a chance to put right any bad system configuration changes you made previously. You also have access to graphical backup tools. If you get stuck you would use these to copy your data on to CD, DVD or even a USB drive before reformatting and installing the system from scratch.

Linux should play well with all versions of Windows, as long as you install it after you install Windows. However, as noted above, because Vista uses a newer version of NTFS, you shouldn't let Linux repartition the disk. Instead, use Vista's disk management software and install into the partition you create with it.

To do this in Vista, click on the Start button, then select the Control Panel. Select System and Maintenance and click on Administrative Tools. Double-click on Computer Management. In the Navigation pane, under Storage, click Disk Management. Right-click on the volume and select Shrink Volume. Enter the size you'd like (say, 50 per cent of the space) and press OK. Right-click on the free space to create a new volume. When you install Linux, use this new partition.



▲ Before installing another operating system, make space in Vista because the NTFS specification has changed

After installing Linux, it should have installed Grub as the boot loader. This should provide a Windows boot option. If not, first copy the Grub configuration file to create a backup like this:

```
cp /boot/grub/menu.lst /boot/grub/
menu.lst.bak
```

Next, open /boot/grub/menu.lst and add the following boot option for Vista:

```
title          "Windows Vista"
root           (hd0,0)
chainloader    +1
```

The (hd0,0) assumes you have an IDE disk. If it's a SCSI device, use the following:

```
title          "Windows Vista"
root           (sd0,0)
chainloader    +1
```

The only real difference is the sd0 entry rather than hd0. Both tell Grub to load the boot loader found in the first partition of the first hard disk. This assumes that Windows was the first operating system installed. If the Windows partition was the second on the disk, that second zero in the brackets should be a one instead. You should now be able to see and load Windows from the Grub menu when you boot the machine.

If you install Windows after Linux, Windows will overwrite the Linux boot loader. This is rude but it is not fatal. The Windows boot loaders don't load other operating systems very easily, so it's simpler to install Grub on the MBR and specify options for both Linux and Windows in the menu.lst file.

You can use a Linux Live CD to do this. We are using Ubuntu here, which uses the sudo

prefix command to give you access to root's commands. In other distributions, issue the su root command, enter the root password and forget the sudo prefixes below.

The grub command loads Grub's configuration environment, from which you can install the program as your boot loader:

```
# sudo grub
grub> find /boot/grub/stage1
(hd0,1)
```

This first command asks Grub to tell you where the boot loader resides. In this case, it's the second partition of the first IDE hard disk. Remember, the first partition is zero in Grub:

```
grub> root (hd0,1)
```

This command tells Grub to set the current root device to the one containing the file it found. We need to do this so it knows where to find the code it is about to install on the MBR. We can now issue the setup command to install Grub:

```
grub> setup (hd0)
Checking if "/boot/grub/stage1"
exists... yes
Checking if "/boot/grub/stage2"
exists... yes
Checking if "/boot/grub/e2fs_stage1_
5" exists... yes
Running "embed /boot/grub/e2fs_
stage1_5 (hd0)"... 15 sectors are
embedded.
succeeded
Running "install /boot/grub/stage1
(hd0) (hd0)1+15 p (hd0,1)/boot/
grub/stage2
/boot/grub/menu.lst"... succeeded
```

```
Done.
grub> quit
```

Rebooting will send you straight into Linux. But what about an option in menu.lst to boot Windows? Take a backup of the file and add the following, but using the number for the partition that contains the Windows installation, so:

```
title          "Windows Vista"
root           (hd0,1)
chainloader    +1
```

As before, the 1 indicates that it's on the second partition, because it was installed second. If you want the machine to default to loading Windows, simply swap the order of the entries in menu.lst. Grub will always default to loading the first one.

WEAPONS OF LAST RESORT

Maybe your PC has suffered a problem that the above techniques cannot solve. Before reaching for the manufacturer's rescue disc, try plugging the affected drive into another machine to see if that computer can read it. You may be able to copy your important files to a DVD-R or another disc.

If nothing works, and you decide to sacrifice your data, the last resort is to run the rescue CD that came with your machine. You must reinstall your anti-virus software, then your applications, and finally perform a Windows update.

If you've ever been caught out with an unbootable machine, you'll already know that a recent backup is a precious thing. If you haven't already, make a full backup of your data now. Before installing a second operating system, take a full backup of your system using a disk imaging utility such as Norton Ghost.

Pass masters Booting without a password

Your system might be sound, but what happens if you've forgotten your password, or someone's changed it?

In Linux, you can boot into single-user mode. If you're using LILO as your boot loader, type 'linux single' at the boot prompt before it times out. If you're using GRUB, hit Escape to see the boot options and press e to edit the boot options temporarily. Scroll to the kernel line. Press e again to add to the existing boot options on this line and add the word 'single'. Press Enter and then B to boot.

If you're using a distribution such as Ubuntu that gives a recovery mode option as standard, this will boot you directly into the text-only single user mode. Once in single user mode, root can change anyone's password like this:

```
# passwd <username>
```

After a prompt appears, enter a new password for <username> and confirm it. Use 'sudo su' in Ubuntu to change to the root account first. It won't ask for a password.

CRACKING WINDOWS

Most Windows XP installations have no user passwords. However, if you have used one

but forgotten it, recovering it can be difficult. On booting, the Security Accounts Manager (SAM) file containing the passwords is locked and unreadable. What's more, it's encrypted. The easiest solution is to use a program to boot the machine using an alternative operating system, read the SAM file and decrypt it.

Such programs are expensive for regular users, but one free option is the Login Recovery service (www.loginrecovery.com). Download the software to create a bootable floppy disk. Boot this and it takes a copy of the SAM. Boot into Windows on another machine and upload the extracted file to the site. Within 48 hours, you'll have your password back. It's free, unless you need it sooner, in which case the service costs £15.

In Vista, the first account you create is the administrator account, so if you lose the password for this then you're stuck. Luckily, password recovery is simple and uses a USB memory stick. However, you have to set it up before such a disaster occurs.

Log into the administrator's account. Click on the Start button, and type 'control userpasswords' in the Start Search box. A window appears.

Click on Create a Password Reset Disk. This activates the forgotten password wizard. Click Next and insert a USB storage device. Enter the current administrator's password. The wizard then writes to the USB device. Remove the drive, label it and place it somewhere safe.

If you forget the administrator password, plug the USB device into the machine and click Reset Password. Click Next on the Reset Password Wizard and pick the drive containing the USB reset disk. Enter a new password when prompted and confirm it. Update the USB device with the new password.

The screenshot shows the 'Login Recovery' website. It has a navigation bar with 'Home', 'Upload', 'Results', 'Help', and 'About'. The main content area is titled 'Windows Password Recovery within minutes'. It describes the service as a way to recover user names and passwords for Windows XP, 2000, and Vista. It lists three steps: 1. Download the extraction program to create a bootable floppy disk. 2. Insert the disk into the computer and boot to the program to extract the encrypted password file. 3. Put the disk into an internet-enabled computer and upload the encrypted password file. It also mentions a 'FREE service (takes up to 48 hours)' or a paid service for 'priority access' (£12.95 + VAT (£15.22)). A large red button says 'Download Now!'. At the bottom, it says 'Try now risk free' and 'You only need to pay for the service if you want priority access and only once we have demonstrated'.

▲ If you lose your Windows XP password, services such as Login Recovery can provide a cheap method of retrieving it